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University of Colorado at Boulder

OFFICE OF CONTRACTS AND GRANTS

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Final Technical Report  
Grant No. NAGW-358

15 July 1982 -- 14 October 1984

The objective of the task is to develop a multichannel detector that features compact size, long lifetime, and reliability to be used on planetary missions of long duration, such as the Mars Geosciences/ Climatology Orbiter.

During the course of this program, we have conducted a series of studies with the detector subcontractor, EMR, to develop a Mark II version of the mini-microchannel detector. The Mark I version, which was built by EMR, was intended to be physically compatible with the photomultiplier tubes that were used in the University of Colorado Pioneer Venus and Galileo ultraviolet spectrometers. Our testing of the Mark I version showed them to have a lifetime of approximately one year. The design objective of the Mark II version is increased lifetime and greater quantum efficiency. The first design, which incorporated a demountable flange and a nickel screen, was based on a photomultiplier tube design that included a cold indium seal. During the period of study, EMR made a corporate policy decision to discontinue the manufacture of cold indium seals since detectors of this type are not suitable for high-temperature applications such as oil well exploration. A second design has now been studied which is based on standard vacuum parts that are more suitable for limited production of custom tubes. A diagram of this design is attached. This design is similar to a version of a tube that we developed and used in our rocket program. The detector from the rocket program, which was fabricated in July 1981, is still operating with the same quantum efficiency. We considered this result as evidence that the basic idea of active pumping is the best technique for a long-lifetime tube. In the new design for the Mark II microchannel detector, the design requirement was for a small, lightweight, low-power ion pump to maintain the vacuum.

Four Mark II multianode microchannel detectors were fabricated. Two detectors with CsI (G) photocathodes and two with CsTe (F) photocathodes. The detectors were tested for quantum efficiency and signal-to-noise ratio. The detectors were then subjected to 18.5g vibration with no change in performance. The detectors were fabricated in August 1983. Two of the tubes have satisfactory sensitivity and noise characteristics. They are three years old and continue to perform nominally.

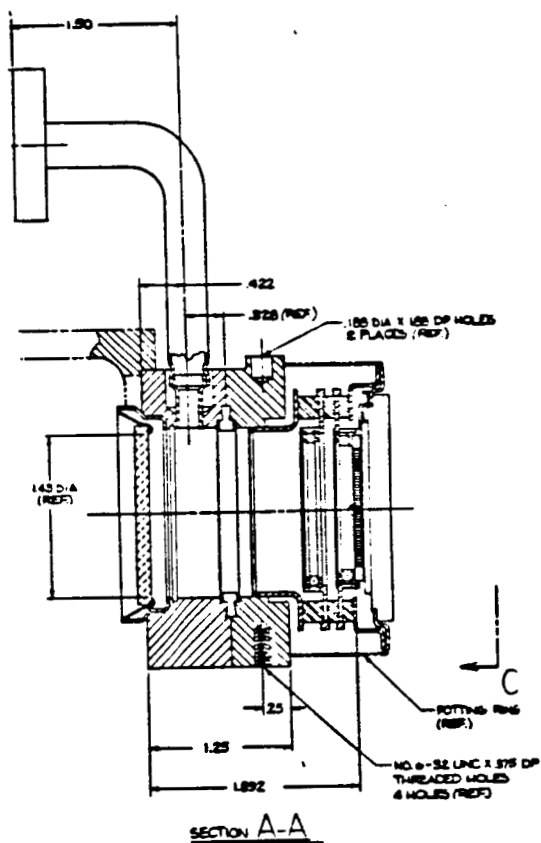
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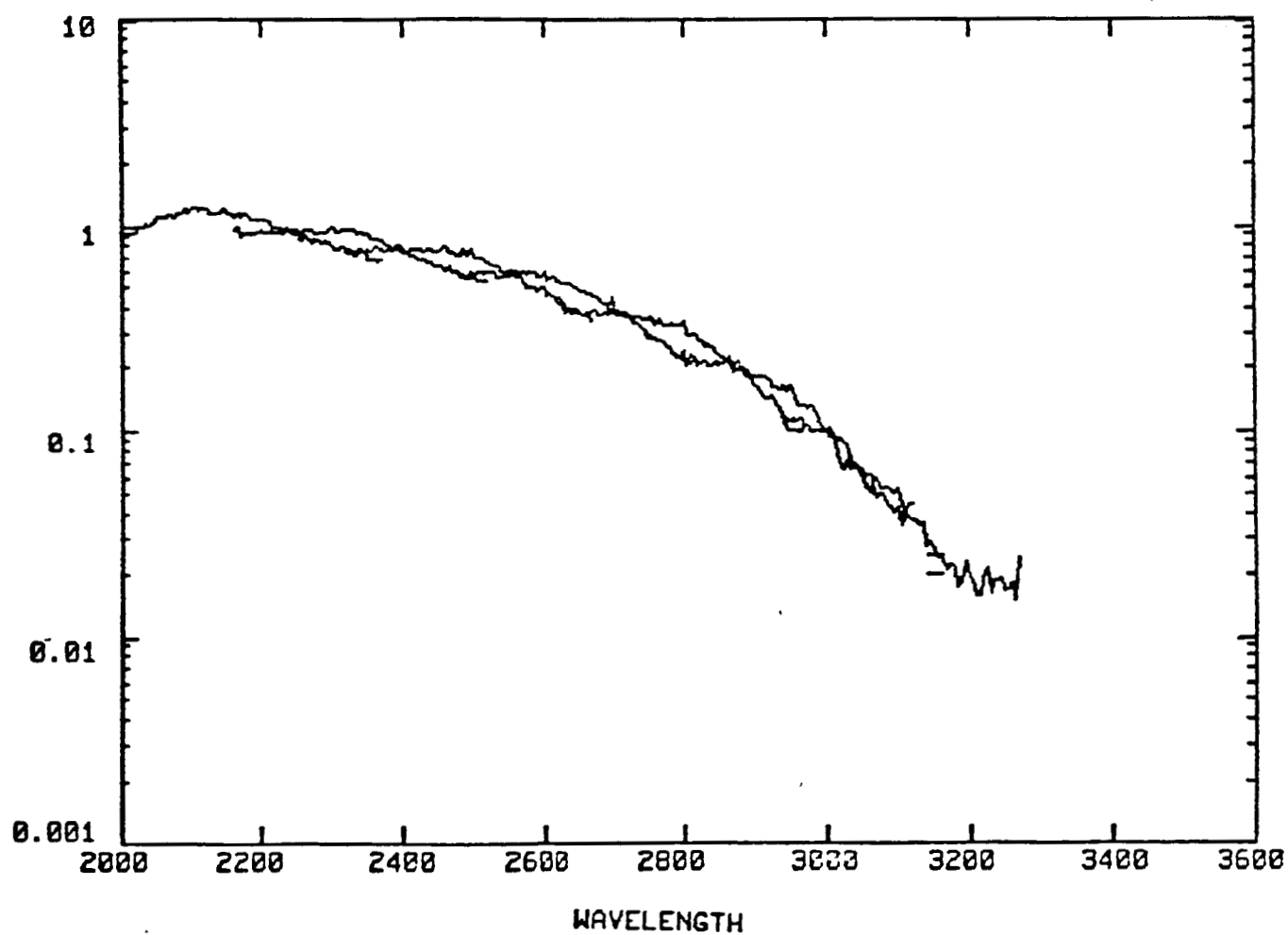
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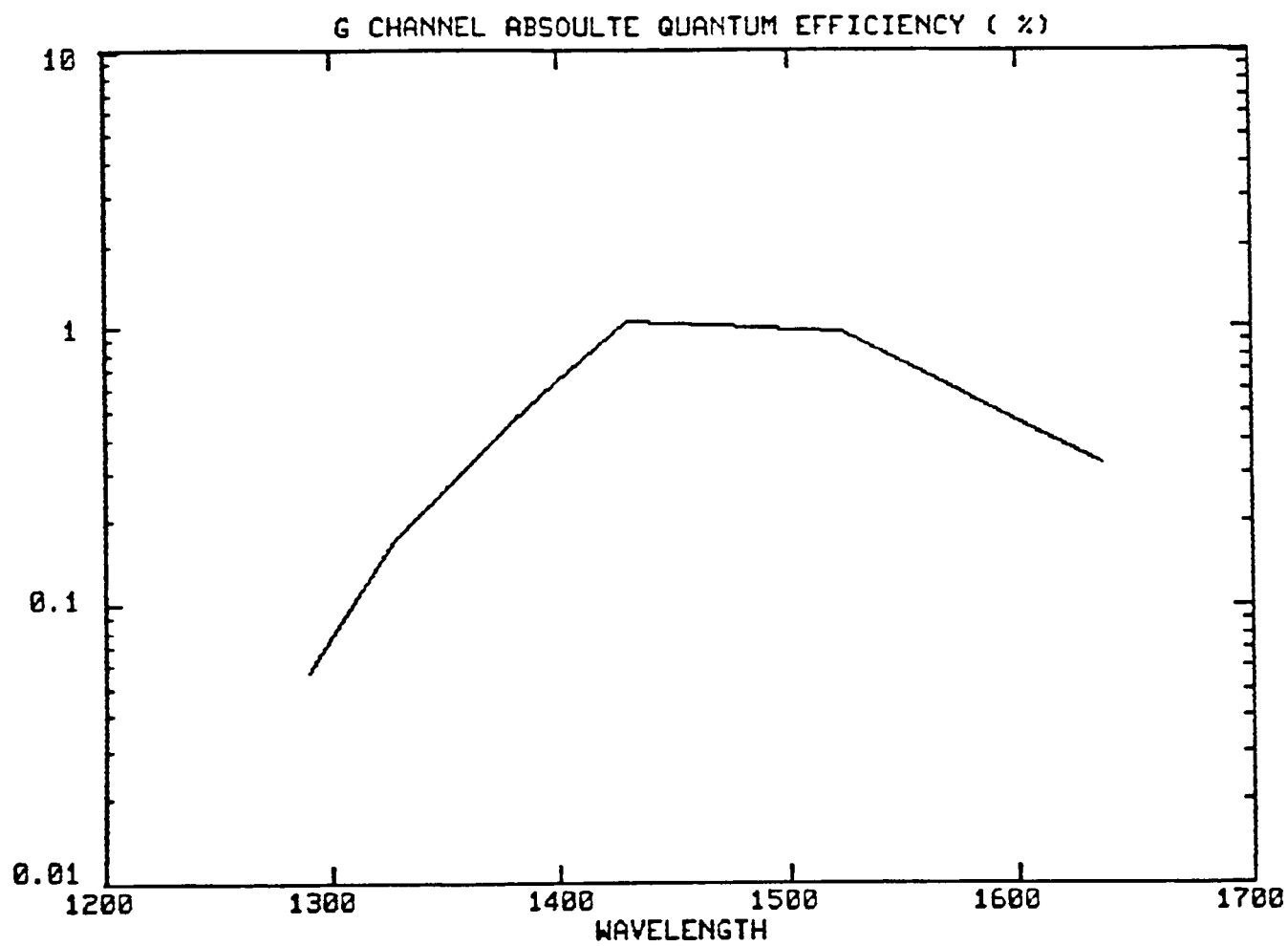
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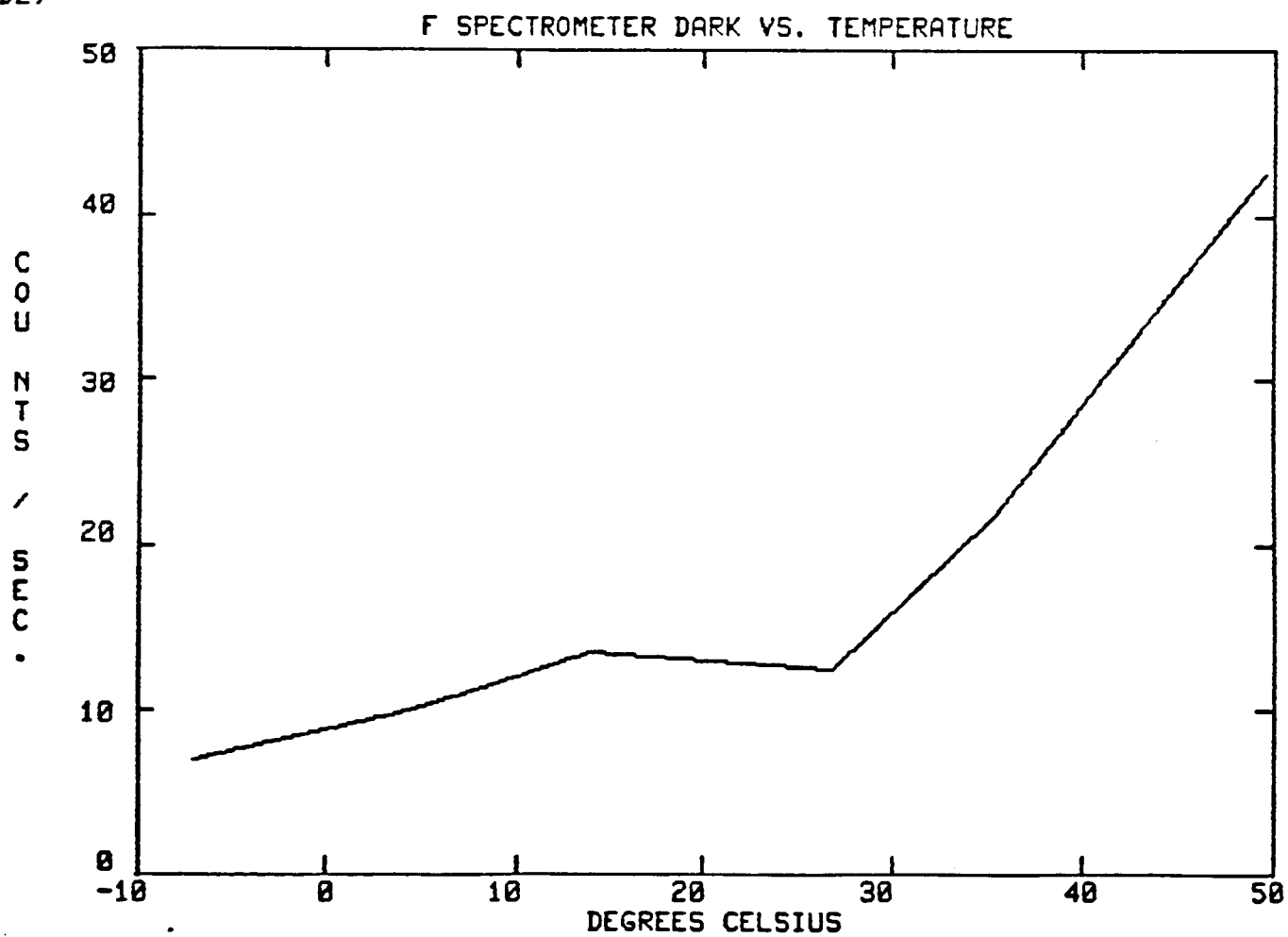
MARK II  
MULTI-ANODE MICROCHANNEL ARRAY DETECTOR

F CHANNEL ABSOLUTE QUANTUM EFFICIENCY (%)





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